

## A NEW OSTEOPLASTIC AMPUTATION AT THE ANKLE-JOINT.<sup>1</sup>

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At the very outset I would state that in the following remarks I shall not discuss those amputations in which a portion of the os calcis or astragalus can be preserved. No one who has had any experience with the Pirogoff amputation, or with any one of its numerous modifications, will or can deny that the ultimate results are simply ideal, and to my mind, at least, there can be no discussion nor improvement when an amputation of this nature can be performed. This operation, therefore, should be the operation of choice in all those cases in which the disease, or trauma for which the amputation is performed, lies distally to the tibiotarsal articulation, provided always, of course, that the os calcis is healthy, and that there is sufficient integument to cover the stump. There occur, however, a number of cases in which the provisions above stated do not exist, and recourse must be had either to an amputation higher up on the leg, or, in a few rarer instances, to the so-called Syme's amputation. It is particularly of this latter class that I wish to speak, as I believe I have devised a method which, while preserving all the good qualities of the Syme method, excludes all of its drawbacks and disadvantages.

At this place I shall not dilate upon the good qualities of the Syme stump, as they are well known to everybody; but its one disadvantage must be emphasized. Personally, I am absolutely convinced that, as far as function is concerned, a stump formed according to the method usually given for a Syme's

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amputation must *eo ipso* be bad, because the distal extremity of the stump is formed by bone sawn transversely across. I am fully aware of the fact that I should hesitate to express myself so forcibly about a well-recognized and universally adopted method, but I have reason to believe that this drawback of the operation is not sufficiently appreciated.

In an article which appeared in the *Medical News* of February 9, 1901, and in which I referred particularly to the valuable studies of Bier, I have already stated fully the reasons of faulty stumps, and, just to recapitulate briefly, I would say, that an amputation stump can be good only if the distal extremity is covered, either by normal cartilage, as, for instance, in an exarticulation, or if the sawn surface is covered or sealed by normal bone, covered by normal periosteum, taken either from the bone amputated or from an adjoining bone. I believe this to be the fundamental principle and the *sine qua non* in the formation of all amputation stumps, and, provided, there were no contraindications, I have always been guided by this principle when performing an amputation on any part of the body. Everything else, as the shape of the stump, the form of the incision, the size of the stump, the skin or muscle covering the stump, is secondary, and must give way to the first requirement, provided it can be our aim at all to form a good, end-bearing stump. Let us now investigate an ordinary Syme stump, and see whether it will correspond to the above requirements, and if what I have said is true, then I trust you will also very readily agree with me that my remarks regarding the poor quality of the Syme stump are not too forcible.

In the original Syme's amputation both malleoli are sawed off, as well as a thin lamella of the tibia; in other words, a sawn surface is exposed everywhere. It is true that both Syme and, since his time, others have modified the operation in so far that they have left in place the cartilage-covered surface of the distal extremity of the tibia, and have sawed off the malleoli only; while from my stand-point the original operation was bad in all respects, the later modification was anatomically only half as bad, as it exposed a sawn surface only on two sides, but

functionally it was just as bad as the original amputation, because it could never form a good, end-bearing stump.

It is only lately that I discussed this point with a very skilful manufacturer of artificial protheses, and, contrary to my firm assertion, he insisted upon the superior qualities of the Syme stump, and offered to prove his statements by at least one end-bearing Syme stump. Subsequently, he gave me an op-

FIG. 1.

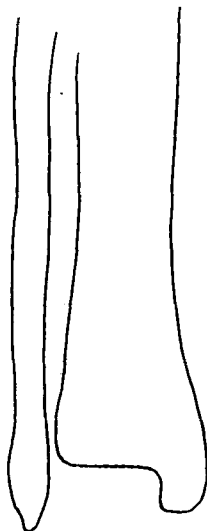


Diagram of tibia and fibula after exarticulation of the foot.

portunity to examine this stump, and on investigation, it is true, I found an end-bearing stump, which, however, proved to be not a Syme but a Pirogoff. I am also compelled to exclude those occasionally seen stumps, which are formed by a true exarticulation of the foot, without interfering in any way with the malleoli; these, as I have pointed out, must be, like all ex-articulations, perfect stumps; but this method of operation is only rarely indicated, and is not a Syme's amputation.

The question, therefore, was how to amputate the foot at the ankle-joint, and yet leave nowhere the sawn surface of any bone. I have solved the question in the following manner:

The cutaneous incision is made in such manner and such place that we can obtain ample, healthy skin for covering the stump; if there is any choice, it is preferable, of course, to carry the incision in such a manner that the resulting cicatrix

FIG. 2.

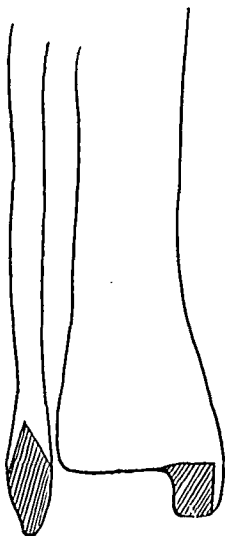


Diagram showing portions of bone to be excised.

will not come to lie directly on the end of the stump; and of these two preferably anteriorly, because then the integument covering the stump will be formed out of the thick heavy skin forming the heel; but on no account should the length of the stump be sacrificed for the heel-flap.

After retraction of the skin there follows a rapid exarticulation of the foot at the ankle-joint; this exposes the two

malleoli and the contiguous portion of the tibia covered by its cartilage.

An irregular octohedra-shaped piece of bone is now sawn out of the fibula in the following manner. The saw enters the fibula on the inner side, approximately on the level of the cartilage covering the tibia, and is carried obliquely upward and outward for a distance of about one and one-half centimetres to within one or two millimetres of the external surface of the

FIG. 3.

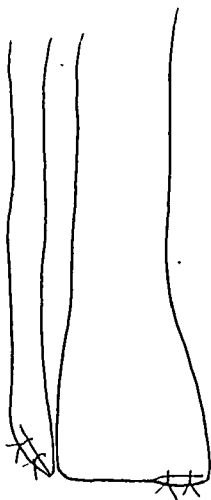


Diagram of stump after suturing the two osteoperiosteal flaps.

fibula; the saw is now withdrawn and made to enter the external surface of the fibula, also at the level of the cartilage covering the tibia, and is then carried mainly upward, but with a slight deviation inward, until it meets the end of the first saw-cut, thereby preparing a small osteoperiosteal flap from the outer surface of the fibula, which can be readily fractured and deflected temporarily outward. The portion of bone removed has the shape of an irregular octohedron; one apex of this is at

the tip of the malleolus, the other one is at the junction of the two sawn surfaces, while the two lateral borders are on the external and internal surfaces of the fibula, on a level with the cartilage covering the tibia. The two sawn surfaces are now approximated and fastened by catgut sutures, which pass through the periosteum covering the parts. (See diagram.)

We now turn our attention to the tibia. As is well known, the internal malleolus is shorter and thicker; the procedure has to be varied somewhat therefore. The saw enters the inferior surface of the malleolus about two millimetres from its internal surface, and is carried in an upward direction up to the level of the cartilage covering the tibia; this forms a small osteoperiosteal flap from the inner surface of the malleolus, which is temporarily deflected inward. The remaining portion of the malleolus is now removed with a saw, also on a level with the cartilaginous surface. The two sawn surfaces are now approximated and held in place by means of catgut sutures, which pass through the periosteum covering the parts. (See diagrams.)

Let me emphasize by stating once more that the good qualities of a stump depend entirely and absolutely only upon the bone; and in order to have these qualities, the end of the bone must be covered either by its normal cartilage, or by bone covered by its normal periosteum. Let us now look at the composition of the stump made by the method outlined above; if properly made, we will find a broad stump divisible into three surfaces, viz., a small inner one, and a smaller outer one, covered by normal bone and periosteum, and a larger central one, covered by normal cartilage; all in all, we find all the requirements present for the formation of a perfect, end-bearing stump.

The final step consists of accurate hæmostasis, followed by suturing of the skin, after the introduction of suitable drainage, if indicated.

The feasibility of this operation occurred to me some five years ago, when I first began to perform amputations by osteoplastic methods, but not until the past year did a suitable case

offer itself for a trial. Following is a brief extract from the history of the case:

J. K., a miner by occupation, and twenty-three years of age, injured his left foot on February 28, 1903, by a block of coal falling upon it; the injury crushed the tarsus and metatarsus, and the subsequent sloughing caused an extensive loss of the integument and subcutaneous tissues, involving both the dorsum and planta pedis, from near the ankle-joint almost to the toes. He was admitted to Mount Sinai Hospital on September 27, 1903, at which time the following condition was found. The left foot was in a position of pes equinus. The integument of most of the dorsal and plantar surfaces of the foot was destroyed and replaced by a mass of scar tissue, densely adherent to all the underlying bones; a large irregular ulcer occupied the heel and lateral portions of the foot. With this local condition an amputation was the only remedy, and its performance was relegated to me by Dr. Arpad G. Gerster, in whose service the case was.

Operation, October 2, 1903. The incision was absolutely irregular in outline, owing to the encroachment of the ulcerated surface into the seat of the operation. In other respects the operation was performed exactly according to the method outlined above. Primary union resulted, with the exception of a small sinus, which continued to secrete for a long time an aseptic synovial fluid. This persisted for so long a time that on December 7 the sinus was enlarged, and the synovial membrane covering the cartilage was scarified and some of the lateral margins curetted. The ultimate closure of the wound was therefore protracted, but finally patient was discharged perfectly cured on January 17, 1904.

Accompanying skiagraph (Fig. 4), taken five weeks after operation, shows firm union of the two osteoperiosteal flaps. The stump resulting from the operation was perfect in all respects; the patient could walk upon it on the bare floor without the least protection, and no amount of pressure could elicit the slightest pain in it. He now wears a prothesis which is only about two inches higher than an ordinary shoe; walks only with an indication of lameness, and has returned to his rather arduous work as a miner.

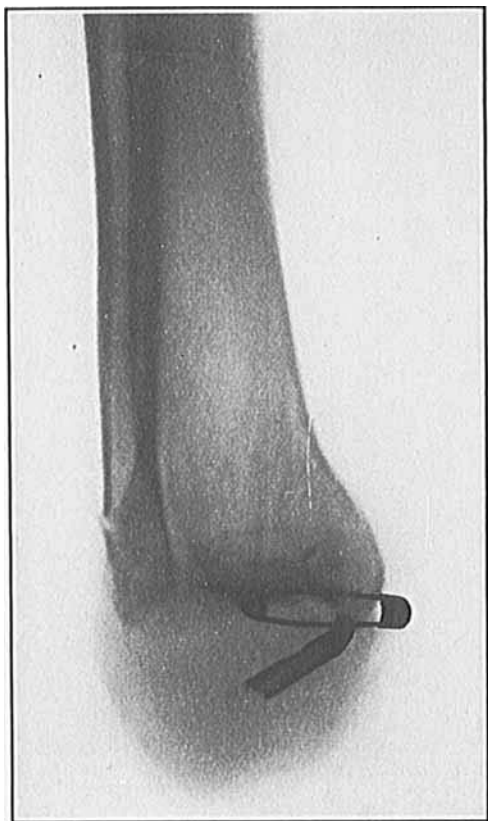


FIG. 4.—Skilagraph of stump.



It might, and with propriety, be argued that I assume great privileges to recommend an operation which I have personally tested but once; in reply to this I can only say that in the case tried the ultimate result, as far as function, etc., is concerned, was absolutely perfect in all details, and that for theoretical, but nevertheless fully tried reasons in other amputations, this modification of amputations at the ankle-joint is and must be perfect.